

SEPTEMBER 1972

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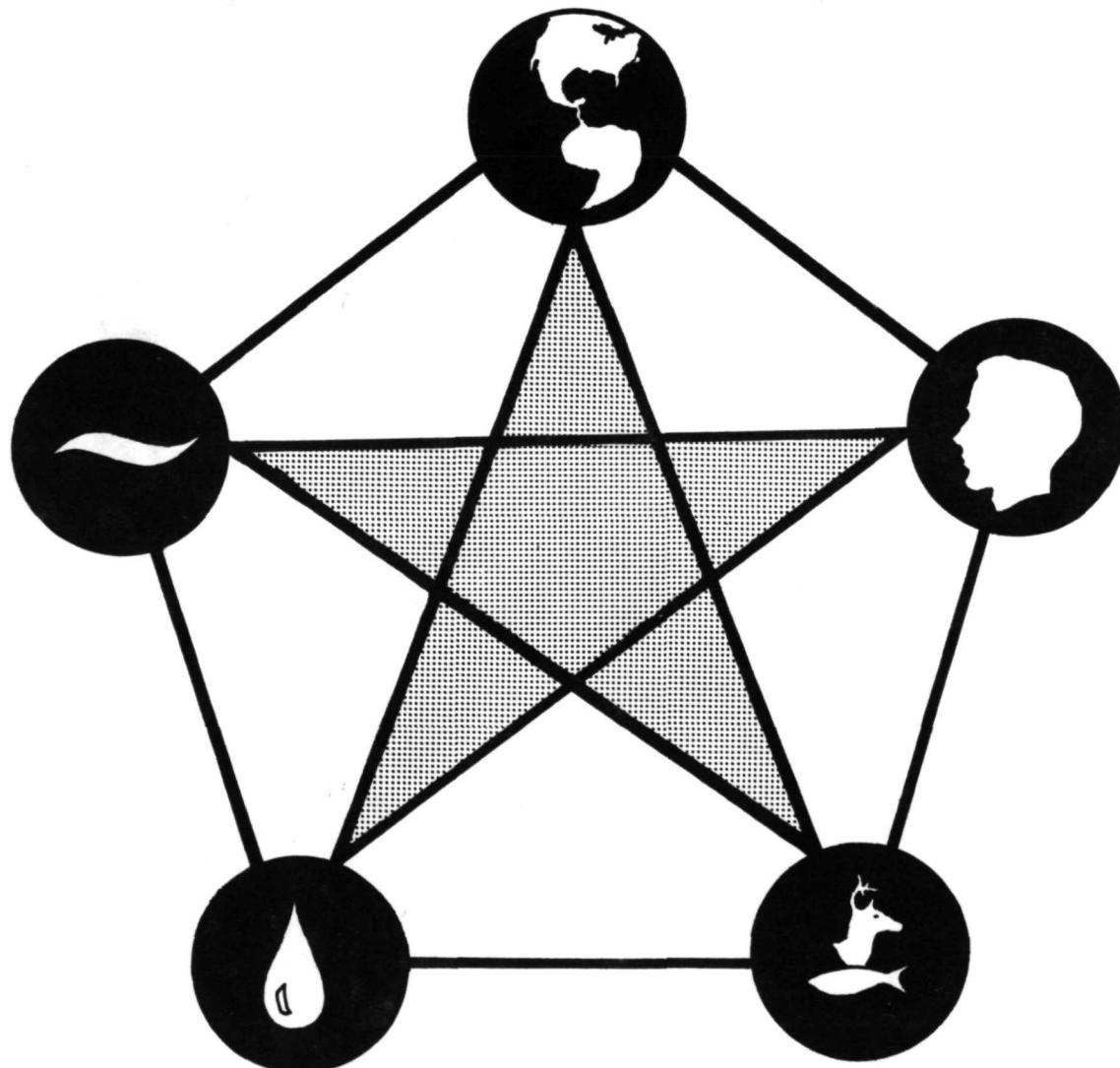
NASA CR-61394

# ERISTAR

(NASA-CR-61394) ERISTAR: EARTH RESOURCES  
INFORMATION STORAGE, TRANSFORMATION,  
ANALYSIS, AND RETRIEVAL ADMINISTRATIVE  
REPORT NASA/ASEE R.I. Vachon, et al  
(Auburn Univ.) Sep. 1972 54 p CSCL 05B G3/13

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SCHOOL OF ENGINEERING  
AUBURN UNIVERSITY  
AUBURN ALABAMA 36830

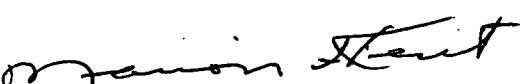
ADMINISTRATIVE REPORT  
NASA GRANT NGT-01-003-044

NASA/ASEE SYSTEMS  
DESIGN SUMMER  
FACULTY PROGRAM

COVER EXPLANATION

The five symbols connected by a pentagon and encompassing a star on the cover represent the unity of environmental resources as considered by the ERISTAR designers. The symbols starting with the earth at the top and proceeding counter clockwise represent: the atmosphere, hydrosphere, biosphere and man himself.

## TECHNICAL REPORT STANDARD TITLE PAGE

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16. ABSTRACT  Because of the success of previous years' programs, NASA in association with ASEE again sponsored Summer Faculty Fellowship Programs in both Research and Systems Engineering Design. This report concerns the 1972 Systems Engineering program at Marshall Space Flight Center where 15 participants representing 15 U.S. universities, 1 NASA/MSFC employee, and another specially assigned faculty member, participated in an 11-week program. The Fellows became acquainted with the philosophy of systems engineering, and as a training exercise, used this approach to produce a conceptional design for an Earth Resources Information Storage, Transformation, Analysis, and Retrieval System.			
The program was conducted in three phases; approximately 3 weeks were devoted to seminars, tours, and other presentations to subject the participants to technical and other aspects of the information management problem. The second phase, 5 weeks in length, consisted of evaluating alternative solutions to problems, effecting initial trade-offs and performing preliminary design studies and analyses. The last 3 weeks were occupied with final trade-off sessions, final design analyses and preparation of a final report and oral presentation. A separate detailed technical report has been written and given wide distribution (NASA CR-61392).			
The program evaluation indicated the objectives of the program were met, and the participants were extremely pleased with the summer experience.			
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# ERISTAR

EARTH RESOURCES INFORMATION STORAGE, TRANSFORMATION, ANALYSIS, AND RETRIEVAL

## ADMINISTRATIVE REPORT

TO

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ON

NASA-ASEE ENGINEERING SYSTEMS DESIGN

FACULTY FELLOWSHIP PROGRAM

Conducted by

Auburn University

at

Marshall Space Flight Center

June 5 - August 18, 1972

Under

Grant NGT 01-003-044

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Auburn University  
Director

Mr. J. Fred O'Brien, Jr.  
Engineering Extension Service  
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Dr. Russell E. Lueg  
Professor  
University of Alabama  
Associate Director

Dr. J. E. Cox  
Associate Professor  
University of Houston  
Consultant

September, 1972

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## I. INTRODUCTION

Beginning in the summer of 1964, the National Aeronautics and Space Administration, in association with the American Society for Engineering Education, has sponsored Summer Faculty Fellowship Programs wherein faculty members from colleges and universities across the nation participated in research type activities at each of eight NASA Centers. These programs have been jointly conducted by the Centers and local universities and have been very successful. In 1966, a somewhat similar summer program in Systems Engineering Design was begun at Stanford University - Ames Research Center. Subsequently, three other summer programs in Systems Engineering Design have been started at other NASA Centers making a total of twelve programs. This report concerns the 1972 Summer Faculty Systems Engineering Design Program conducted jointly by Marshall Space Flight Center and Auburn University. (See Appendix I for description of other programs.)

The purpose of the design programs is to develop systems approach philosophy by multidisciplinary group participation in a design training experience. The objectives are: (1) to increase competence and to develop concepts which will enable participants to organize multidisciplinary engineering systems design programs and courses at their home institutions and, (2) to establish and further communications and collaborations between engineering and other disciplines.

The group effort at Marshall Space Flight Center produced ERISTAR which is a systems design for an Earth Resources Information Storage, Transformation, Analysis, and Retrieval System. A complete report to describe the study will be distributed separately. However, the resulting design is of secondary importance to the training aspect of the program.

It is hoped the faculty members who participated will use the experience gained this summer to develop the systems approach in courses and other applications at their home institutions as well as to lead others in system solutions of complex multidisciplinary problems. The approach can be applied in solving socio-economic problems as well as engineering and other technical problems as has been demonstrated by the history of this program.

## II. RECRUITMENT AND SELECTION OF PARTICIPANTS

Again in 1972, publicity and program information dissemination was centralized through the Headquarters Office, ASEE, Washington, D. C. As in previous years, a flyer (see Appendix I) as well as an extended brochure was prepared and mailed to all Deans and Department Chairmen in most all Schools of Engineering in the U. S.. The program was advertised in the ASEE Journal as well as other national magazines. A letter was sent to a number of universities soliciting faculty from areas other than engineering because of the nature of the program (see Appendix I).

In addition to the national effort, the Program Director and Staff also did as much as possible to advertise the program by contacting and sending the literature to the participants of previous programs, writing to Deans and Department Chairmen of several schools, making announcements at educational meetings (such as committee meetings and conferences), making personal telephone calls and by doing other various things to promote the program. The personnel office at the Marshall Center also took every opportunity to encourage faculty members with whom it came in contact to apply for participation in the program.

As a result of the excellent promotion, more than 150 applications were received, 64 of which listed the Auburn Systems Design Program as first choice. In addition, several more applications received by other programs which did not indicate a second or third choice were also considered. Having received this many applications, most of which were from highly qualified and desirable applicants, selection of participants was very difficult. As a result, however, it is thought that the program this year benefited greatly by those who were selected to participate as Fellows. It is indeed regretable, however, that there were those who

were qualified, and were from schools who could and would benefit, that could not be selected as participants due to the limitation on the total number of fellowships available.

The program staff, including personnel at the Marshall Center, carefully reviewed each application and aligned them into categories of prime candidates and alternates. Consideration was given to teaching, research and design experience, age, university represented, scholastic background, disciplines represented, and potential relationship to the design problem to be studied. Attention was given to the potential benefit of the program to the individual, his university, and education in general.

Twenty applicants were selected and offers extended. When acceptances were known, those listed as alternates were released to other programs.

Figure 1 is a photograph of the 1972 Systems Engineering Design Program Fellows. Appendix I contains lists of applicants, participants, and statistical information concerning the Fellows.

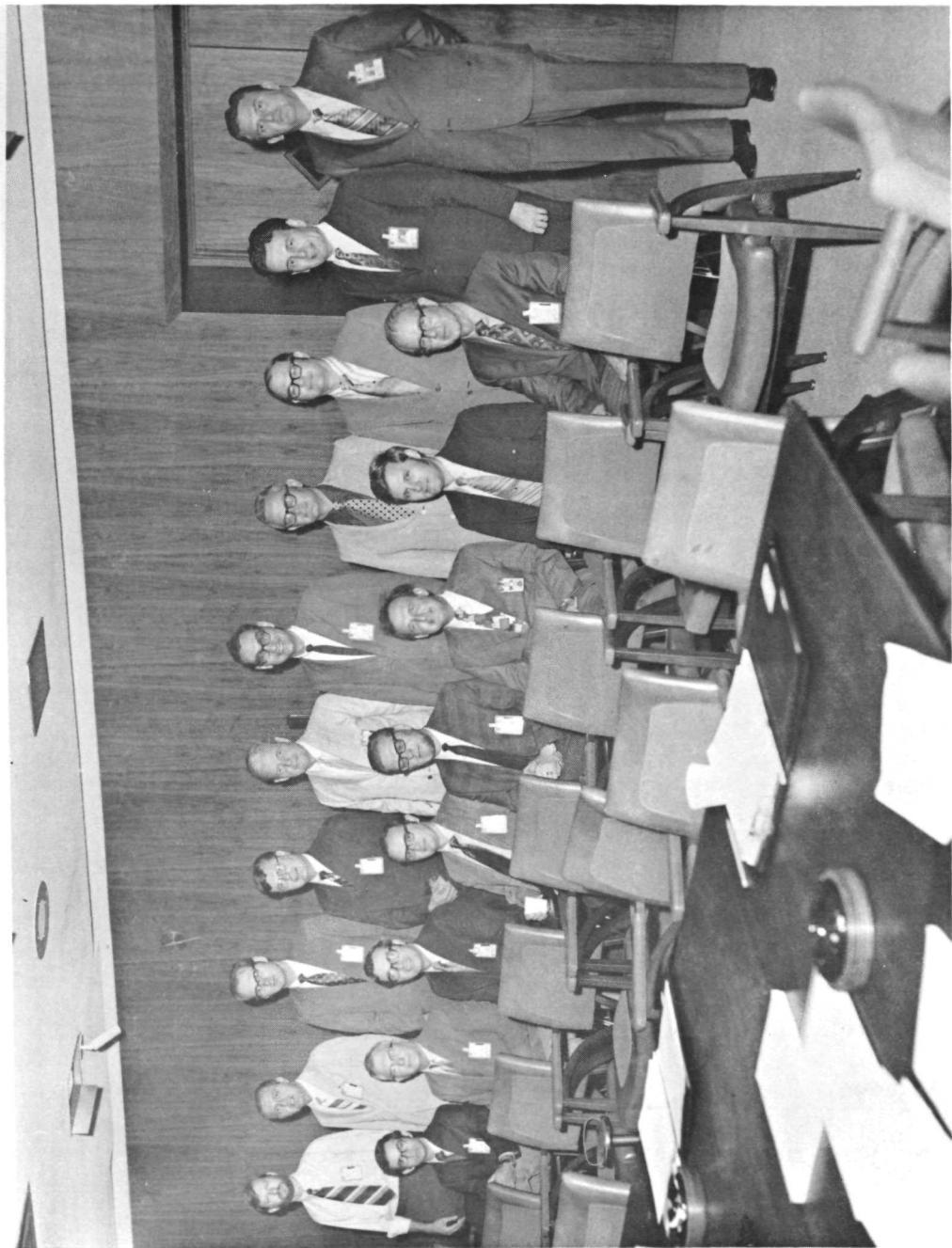


FIGURE 1 - SUMMER FACULTY FELLOWS AND STAFF

Front Row - (Left to Right) Dr. R. C. Gonzalez, Dr. T. A. Meyer, Dr. W. E. Biles, Dr. J. J. Talavage, Professor L. F. Boness, Mr. H. G. Hamby, Mr. C. W. Messer, Dr. L. I. Briggs

Second Row - Dr. C. W. Skinner, Professor J. L. G. Emplaincourt, Dr. R. O. Hoffman, Dr. A. C. Ruppel, Dr. R. C. Gerhan, Dr. W. O. Clark, Dr. C. B. Estes, Dr. R. I. Vachon, Dr. R. E. Lueg, Mr. J. F. O'Brien

### III. PROGRAM ADMINISTRATION AND DESCRIPTION

The 1972 Systems Engineering Design Program at Marshall Space Flight Center was developed and implemented by a staff consisting of representatives from Auburn University and Marshall Space Flight Center. Dr. R. I. Vachon, Auburn, and Mr. Herman G. Hamby, Marshall Space Flight Center, served as Co-directors. Dr. Russell E. Lueg, University of Alabama, temporarily appointed to Auburn University, served as Associated Director and Mr. J. Fred O'Brien, Jr., Auburn, served as Administrative Director. Dr. J. E. Cox, University of Houston, served as Staff Consultant.

The program began in January with the solicitation and processing of applications, selection of participants, and detailed planning for the eleven-week summer period. Several meetings involving the entire program staff, as well as other interested persons at Marshall, were held to determine the facility requirements, physical location at Marshall Space Flight Center, and other needs and directions in which the program would follow. As in the past, the topic for the training exercise was chosen to coincide with a current effort or interest at Marshall Space Flight Center. The Systems Design of Earth Resources Information Management System was chosen as the topic.

By the end of March, acceptances to offers had been received and the participants were known. Security clearnace applications were submitted, details of the program, reporting date, housing information, and other domestic details were carried out during April and May. Administrative needs and details such as program stationery, identification cards,

secretarial assistance, stenographic equipment, and other miscellaneous requirements were handled well in advance of the official starting date, June 5, 1972. Figure 2 is a Program Schedule and Flow Chart which indicates the major administrative requirements and arrangements.

All administrative support and liaison such as stipend disbursement, travel disbursement, security clearance processing, etc., was coordinated between Marshall and Auburn University through the office of the Administrative Director. Stipends were based on the maximum figures negotiated in the contract with NASA Headquarters and were disbursed as follows: Fifty percent on June 5, twenty-five percent on July 12, and twenty-five percent on the last day of the program. Travel expense reimbursement was based on Auburn University travel regulations which provided mileage and per diem allowances. Disbursement was made to each individual in two checks; one to cover expenses for coming to the program, and the other for expenses going home from the program.

The Marshall Space Flight Center provided facilities and support. The participants and staff were provided office space in Building 4202 at MSFC. The cooperation and support of the major divisions of MSFC as well as of offices such as Security, Protocol, Public Affairs, Personnel, Training, and other supporting elements were outstanding and completely adequate.

At the beginning of the program, and after the first few days of orientation into the physical surroundings and getting acquainted with each other, the participants organized themselves into task groups commensurate with both the disciplines represented and the mission requirements. Figure 3 is an Organizational Chart of the program. A project

# ASEE - NASA DESIGN PROGRAM 1972

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT

LETTERS TO  
DEANS

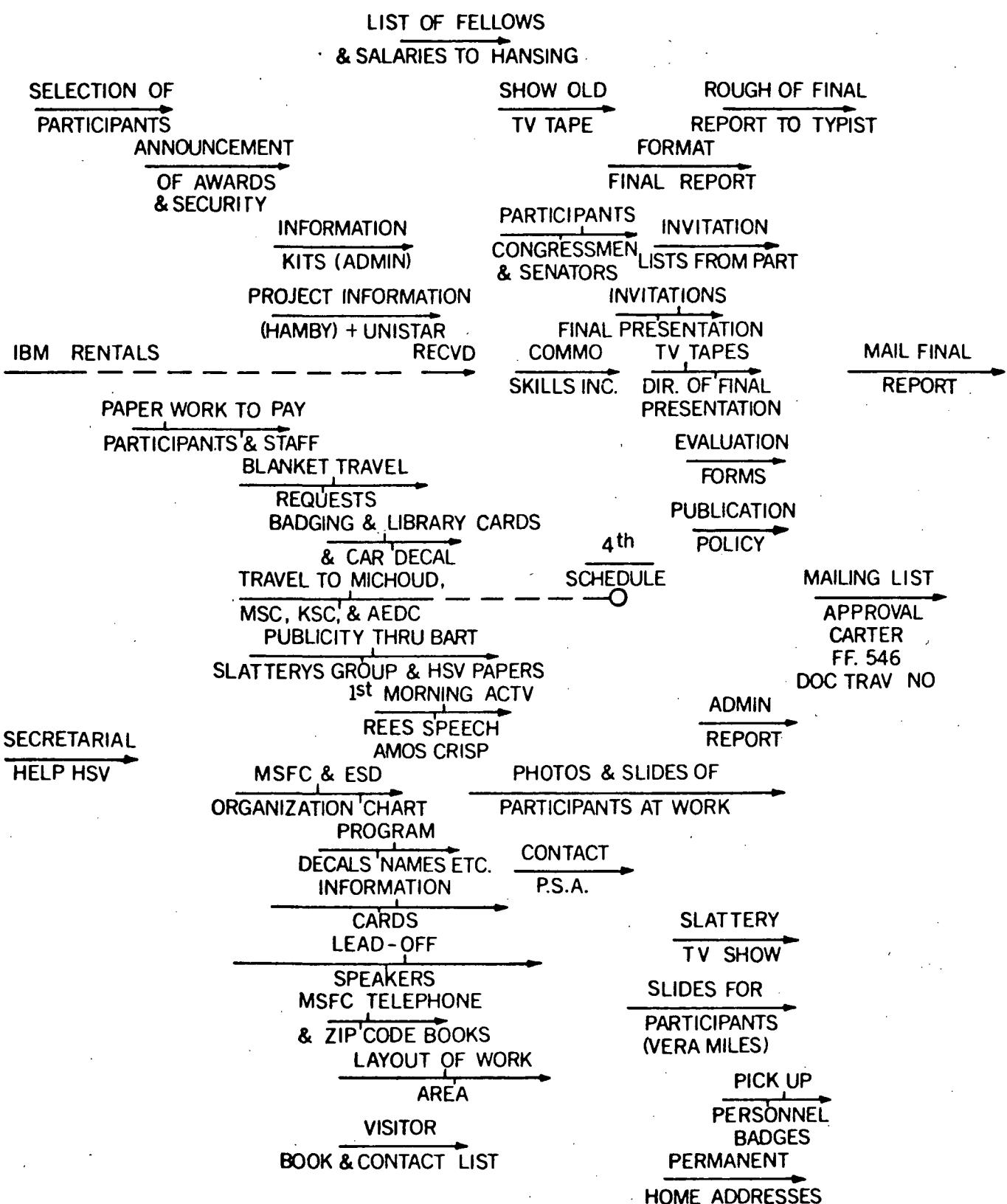
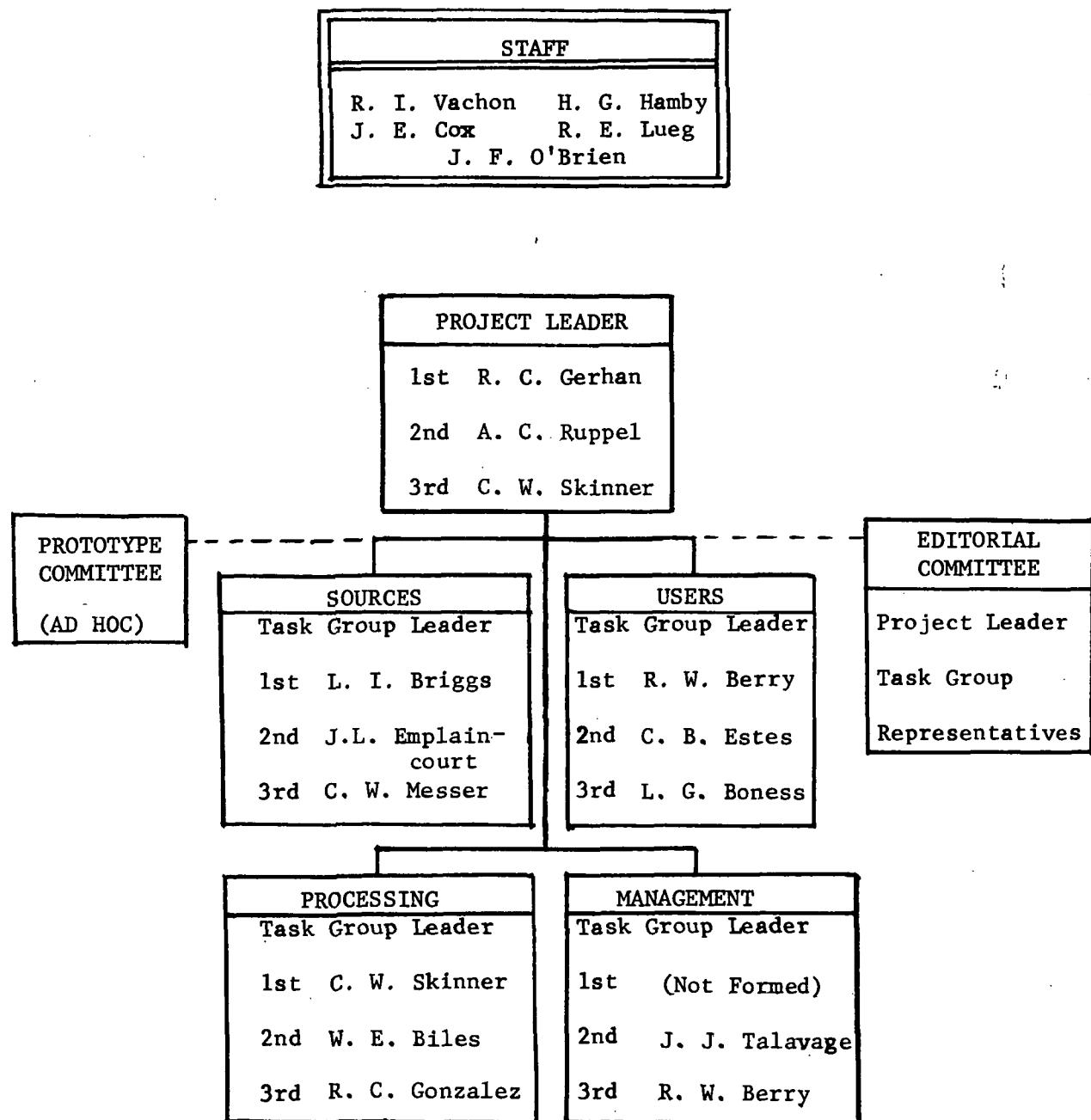


FIGURE 2. Flow Chart of Major Functions

FIGURE 3. PROGRAM ORGANIZATIONAL STRUCTURE



leader and task group leaders were elected three times during the program, thus providing the maximum benefit to as many participants as possible. The project leader met each morning with the program staff and then with his task group leaders to review progress and to resolve technical questions. In addition, all groups conducted individual and joint seminars, interviews, and other informal meetings on the project and educational aspects of the program.

In order to efficiently carry out the training aspects of the systems engineering approach, the organization and conduct of the official eleven-week period was done in three phases. The first phase, approximately three weeks, was an orientation period where the participants were subjected to a large number of high quality technical and design problem oriented seminars and presentations on subjects describing the national space program as well as the future concepts of earth orbiting vehicles and systems. From these seminars, contacts with Marshall and other areas were established and this provided a source of more detailed information needed in latter phases of the program, as well as established a base of knowledge for thought.

A tour of the Marshall Center and a tour and work session at the Manned Space Flight Center were conducted to further orient and provide a "feel" for space program size and identification that otherwise could not have been provided. The first of two interim reports was written.

The next five weeks were spent evaluating design concepts, providing alternative solutions to problems, tentatively establishing the basic requirements and systems needed, and performing general systems analysis. Then initial trade-offs were effected, alternate or new systems and subsystems

were integrated into the total concept, further refinement was attempted, and an interim first-trial presentation was staged and the second interim report was written.

The last three weeks were used to determine, through final trade-offs, the final complete design, mission description, and identification. Preparation of a rough draft of the final report and an oral presentation were also done during this period.

The program was concluded on August 18, 1972, with a final oral technical presentation in the Morris Auditorium of the main building in the Headquarters Complex at the Marshall Center. Appendix II contains a sample of the program folder. The two-hour presentation, complete with visual aids, was conducted by the entire group and the attending audience was comprised of representatives of all sections of the Marshall Center, several educational institutions, and industrial companies in the area and state, as well as from other states. Over fifteen hundred invitations (a sample is shown in Appendix III) were mailed to invited guests throughout the country. (The presentation was also recorded on both audio and video tape.)

A technical report entitled ERISTAR has been prepared and will be sent to all Deans of Engineering, engineering department heads, members of the ASEE Space Engineering Committee, and other NASA summer faculty fellowship program co-directors, as well as the Fellows' congressmen and senators. This technical report covers the entire project.

#### IV. PROGRAM EVALUATION

Because of the long-range nature of the objectives of the program, total evaluation of the summer experience for the Faculty Fellows will necessarily come later. However, considering some observable aspects of the program such as reactions of the participants, total cooperation of the Marshall Center, general evaluation by the program staff, etc., it is thought that the 1972 Systems Design Program at Marshall was overwhelmingly successful in meeting the objectives. As the program developed and the weeks passed, the participants and staff were able to actually see and identify a definite molding of a team effort, absorption of a new philosophy, and the implementation of the systems approach to the selected design problem. New thought processes were established, technical areas were investigated in a new and different manner which produced more conclusive and usable results, and in general, the enthusiasm and morale of the group was outstanding.

At the end of the program, the participants responded to the questionnaire shown as Figure 4. The detailed answers are summarized and are contained in Appendix IV of this report. Essential points of the summary are as follows:

1. The most prominent means of initial knowledge of the program for the participants was through the ASEE advertisement schemes.
2. The stipend was adequate.

FIGURE 4. AUBURN-MSFC ENGINEERING SYSTEMS DESIGN

Evaluation Form

Please express your thoughts in regard to the program by responding to the following questions. Utilize the back if ample space has not been provided for your answers. Feel free to add any additional comments. Return the forms to the secretary by 4:00 p.m., Thursday, August 19.

NAME: \_\_\_\_\_ HOME INSTITUTION: \_\_\_\_\_

1. How did you first become aware of this program? \_\_\_\_\_
2. Was the Fellowship stipend meager \_\_\_\_\_ adequate \_\_\_\_\_ generous \_\_\_\_\_?
3. Was this work within your field of primary interest? \_\_\_\_\_ yes \_\_\_\_\_ no  
Was the nature of your assignment challenging? \_\_\_\_\_ yes \_\_\_\_\_ no  
If not, what would have made it so. \_\_\_\_\_
4. Would this involvement be of help to you in establishing multidisciplinary design courses at your home institution? \_\_\_\_\_ yes \_\_\_\_\_ no
5. If you answered #4 affirmatively, what additional information will be of particular use to you? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Do you plan to institute a multidisciplinary design program at your institution? \_\_\_\_\_ yes \_\_\_\_\_ no
7. If your answer to #6 is affirmative, what would be the pattern for developing such a program at your institution? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. Were you furnished adequate information and guidance (such as directions, housing information, etc.) in details concerning relocation and coming to the program? \_\_\_\_\_ yes \_\_\_\_\_ no What recommendations do you have to improve this area? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Page 2  
Participant Evaluation Form

9. What from your personal viewpoint are the major advantages of this program?

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10. What from your personal viewpoint are the major disadvantages of this program?

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11. Would you recommend this program to a colleague? \_\_\_\_\_ yes \_\_\_\_\_ no  
Please list names of colleagues who you think would be interested.

- 1.
- 2.
- 3.
- 4.

12. In your opinion do you think the methodology of the Systems Engineering Program to which you have been exposed can be applied to the teaching of courses in your technical discipline? \_\_\_\_\_ yes \_\_\_\_\_ no

If yes, how? If no, why not?

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13. How could future Design Fellowship Programs be improved?

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14. Other Remarks:

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3. Thirteen participants reported they were working directly in their field of interest, and all but one thought the work was very challenging.
4. All Fellows thought the experience would be very helpful and would attempt to apply this experience in various ways back at their home institutions.
5. All thought directions, institutions, information sent before arrival at MSFC were adequate. Some comments were critical of the apartment situation, although all were able to obtain suitable housing eventually.
6. As in past programs, the participants thought the association with other participants, the systems approach experience, change from usual routine, and the opportunity to deal with a real world problem were the greatest advantages of the program. The most predominant disadvantage of the program was the shortage of time for a rather large scope problem area. A lesser point listed was the financial disadvantage.
7. As in past years, the Fellows' comments generally reflected a very positive response, indicating a good experience. They wrestled with a very large and almost undefinable problem, but found the experience enlightening and, although disagreements and frustrations occurred, it is though each participant gained a lot from his summer experience.

## V. CONCLUSIONS

1. There is no question that the objectives of the program are being met in the Systems Engineering Program at MSFC. The evaluation results indicated that the enthusiasm generated among participants will be a continuing element and future applications of the summer experience will be done. All participants left with a positive attitude and desire to continue in this philosophical approach.

2. The large number of applicants responding to program advertisement continues to reflect a wide interest in the program. Consequently, the quality of the applicants continues to rise. It is concluded that this program will continue to attract the top engineering and science educators and that the activity and quality of performance of future Fellows will increase.

3. The program should be continued in future years. However, due to the complexity of the problems and the importance the Center has placed on the summer effort, the staff level is somewhat inadequate in number and it is recommended consideration be given to increasing the staff by one man.

4. Because of the increasing disparity between the participant's average weekly salary and the present level of stipend, it is highly recommended the stipend be raised to \$275.00 and \$300.00 per week for first and second year participants respectfully.

5. The philosophy and techniques employed in the system engineering approach can be applied to the solution of many problems facing the nation today.

## **APPENDIX I**

- 1. Program Advertisement**
- 2. Letter to University President**
- 3. List of Participants and Staff**
- 4. Statistics on Participants**
- 5. List of Program Applicants**

# Summer Faculty Fellowships

For U.S. citizens who are faculty or research staff members, preferably with two years of teaching experience.



**NASA & ASEE**  
National Aeronautics  
& Space Administration



## ENGINEERING SYSTEMS DESIGN

**OBJECTIVES:** (1) To increase competence and to develop concepts which will enable participants to organize multidisciplinary engineering systems design programs and courses at their home institutions. (2) To establish and further communication and collaboration between engineering and other disciplines.

**DESIGN FELLOWSHIPS:** Awarded to young engineering and science faculty members in programs of summer study to be undertaken by several universities in cooperation with NASA research centers. Fellows will come to universities adjacent to NASA centers to participate as members of multidisciplinary design teams. Each group will select and design a complex engineering system, such as an unmanned planetary reconnaissance vehicle, an environmental monitoring and control system, or an information management system. The Fellows will be associated directly with the NASA program and will be confronted with the most modern systems design problems. The engineering systems concept, that of approaching the design problem in its entirety, will be utilized by the faculty design teams.

**FELLOWSHIPS:** Stipends are intended to meet the salary of the participant but will not exceed \$275 per week. Travel allowance will be paid. Approximately 80 Fellowships will be awarded. Several faculty members from a single university are encouraged to participate as a part of a design team.

**DURATION:** 11 weeks.

### PROGRAM DESCRIPTIONS

Marshall Space Flight Center Auburn University  
June 5-August 18, 1972

A complete systems design study of a user oriented Earth Resources Information Management System.

Ames Research Center Stanford University  
June 12-August 25, 1972

The design of a system for the non-agricultural production of food.

Langley Research Center Old Dominion University  
June 12-August 25, 1972

Engineering systems design approach to achieving benefits from human factors engineering in current transportation systems.

Manned Spacecraft Center University of Houston  
Rice University  
June 5-August 18, 1972

A systems study and design of a self-sufficient ecosystem for future application to future lunar and planetary colonization as well as long duration space missions.

## SPACE RESEARCH

Manned Spacecraft Center University of Houston  
Texas A&M University  
June 5-August 11, 1972

Science and applications research in planetary and earth sciences, space medicine and environmental physiology, life support systems, communications, guidance and control, spacecraft propulsion and power generation, structures and mechanics, aerodynamics, spacecraft design and flight operations.

Langley Research Center Old Dominion University  
June 12-August 18, 1972

Research opportunities encompass aerodynamics, structures, materials, operating problems, fluid mechanics, mechanics of flight, energy conversion, space environmental physics, and many others.

Lewis Research Center Case Western Reserve University  
June 12-August 18, 1972

All aspects of research and advanced technology related to propulsion from air-breathing engines and chemical rockets to nuclear and electromagnetic rockets and to power generation from Brayton and Rankine cycle turbogenerators and direct energy conversion devices to solar cells, fuel cells, and thermionic and magnetohydrodynamic generators.

Ames Research Center Stanford University  
June 19-August 25, 1972

Topics for research from aeronautics, atmospheric entry technology, avionics, computer sciences, earth resources, environmental biology, exobiology, biotechnology, instrumentation, spaceflight and systems engineering.

Only U.S. Citizens are eligible

For application forms and information please contact:

Mr. F. X. Bradley, Jr., American Society for Engineering Education  
Suite 400, One Dupont Circle  
Washington, D. C. 20036 Phone: 202-293-7080

APPLICATION DEADLINE: March 1  
ANNOUNCEMENT OF AWARDS: March 15

**1972**

January 21, 1972

President  
University  
City, State, Zip

Dear Sir:

This letter is to solicit applications from faculty interested in the NASA-ASEE Engineering Systems Design Summer Faculty Fellowship Program to be conducted at the Marshall Space Flight Center in Huntsville, Alabama, June 5 to August 18, 1972. We bring this program to your attention because of the multidisciplinary nature of our effort.

The program is sponsored by NASA and the American Society for Engineering Education, but our program participants are sought from all disciplinary areas. The reason for this is that we are offering a summer learning experience in the Systems Approach. This approach requires participants who are interested in learning a multidisciplinary strategy to attack problems and are open minded to gaining from interaction with colleagues in disciplines other than their own. We have found from past experience that faculty in the life sciences, physical sciences and the arts are interested in participating in our programs and have taken their experiences back to their campuses and improved their teaching and/or research. We ask you to alert your talented and imaginative faculty to our program.

This year we will be applying the Systems Approach to an information management system for earth resources data. The concern for our environment is matched with the concern of how to collect, store and disseminate data on the environment to users of such data for the benefit of mankind. Earth resources data are being collected at present without an adequate information management system. The task of this year's summer Faculty Fellows will be to design a prototype system in concert with the users. This task is large, but past experience shows we can contribute.

Please tell your faculty of our program and ask anyone having questions to call me collect.

Cordially,

R. I. Yachon, Director  
1972 Auburn Design Program

RIV:ljb

---

2. Letter to University President

### 3. List of Participants and Staff

#### Summer Faculty Fellowship Program Auburn University Engineering Systems Design 1972

##### Participating Fellows

Dr. Richard W. Berry  
Department of Geology  
California State University, San Diego

Dr. William E. Biles  
Department of Aerospace  
and Mechanical Engineering  
University of Notre Dame

Professor Louis F. Boness  
Computer Technology Department  
Purdue University -  
North Central Campus

Dr. Louis I. Briggs  
Department of Geology and Mineralogy  
University of Michigan

Dr. Wilburn O. Clark  
Electrical Engineering Department  
Arizona State University

Professor Jacques L. G. Emplaincourt  
Department of Geology and Geography  
University of Alabama

Dr. Carl B. Estes  
School of Industrial Engineering  
Oklahoma State University

Dr. Richard C. Gerhan  
Department of Economics  
Baldwin-Wallace College

Dr. Rafael C. Gonzalez  
Electrical Engineering Department  
University of Tennessee

Dr. Richard O. Hoffman  
Department of Industrial  
and Management Systems Engineering  
University of Nebraska

Dr. Donald H. Kraft  
School of Library & Information  
Services  
University of Maryland

Mr. Cecil W. Messer  
Environmental Applications Office -  
NASA  
Marshall Space Flight Center

Dr. Theodore A. Meyer  
Department of Marketing  
University of South Alabama

Dr. Andrew C. Ruppel  
School of Commerce  
University of Virginia

Dr. C. William Skinner  
Department of Computer Science  
North Carolina State University

Dr. Joseph J. Talavage  
Industrial & Systems Engineering  
Georgia Institute of Technology

Dr. J. Mark Elliott  
Department of Mechanical Engineering  
University of South Alabama  
Liaison Research  
Faculty Fellow with  
Environmental Applications Office -  
NASA  
Marshall Space Flight Center

##### Technical and Administrative Staff

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Auburn University

Dr. Russell E. Lueg  
Department of Electrical Engineering  
University of Alabama

Dr. Jim E. Cox  
Department of Mechanical Engineering  
University of Houston

Mr. Herman G. Hamby  
Environmental Applications Office -  
NASA  
Marshall Space Flight Center

Mr. J. Fred O'Brien  
Engineering Extension Service  
Auburn University

1972 AUBURN - MARSHALL SPACE FLIGHT CENTER  
NASA-ASEE SYSTEMS DESIGN PROGRAM

STATISTICAL SUMMARY

Number of Participants	15
Academic Rank	
Professor	3
Associate Professor	2
Assistant Professor	8
Instructor	1
Lecturer	1
Degrees	
PhD	13
MS	1
MBA	1
Average Age	37.7
Average Weekly Salary*	\$360.42 <sup>1</sup>
Disciplines Represented	
Aeronautical & Mechanical	1
Business Administration, Commerce & Marketing	2
Economics	1
Electrical Engineering	2
Geography	1
Geology	2
Industrial Engineering	2
Library Science & Information	1
Mathematics & Computers	2
Systems	1
Universities Represented	15

\*Based on 39 weeks

<sup>1</sup>1971 Average    \$342

4. Statistics on Participants

**FIRST CHOICE APPLICANTS**      **Business Address**  
**Name**      **Business Address & Phone**

Auburn-MSFC Design Program, 1972

<u>Name</u>	<u>Degree</u>	<u>Age</u>	<u>Research and/or Design Interest</u>	<u>Participated Previously</u>
Kraft, Donald H.	Asst. Prof.	Ph.D.	29 Biomedical literature studies	No
	School of Lib. & Info. Sci.			
	Univ. of Maryland College Park, MD20742			
	(301) 454-3016			
Shieh, Paulinus S.	Asst. Prof.	Ph.D.	40 Mathematical modeling of nuclear power units for space applications	MSC - 1970
	Nuclear Engineering			
	Drawer NE			
	Miss. State Univ.			
	State College, MS 39762			
	(601) 325-5450			
Hill, Louis A., Jr.	Professor	Ph.D.	44 Larger scope of systems approach	No
	Civil Engineering			
	College of Eng. Sci.			
	Arizona State Univ.			
	Tempe, Az. 85251			
	(480) 965-3361			
Griggs, Francis E.	Chairman Civil Engr. Dept.	Dr. Engr.	36 Transportation and Urban Affairs	Langley Res. Ctr. - 1970
	Merrimack College			
	North Andover, Mass			
	01845			
	(508) 683-7111			
Gernan, Richard C.	Chairman & Prof.	Ph.D.	52 A complete systems design (multi-disciplinary) of an Earth Resources Information Management System	Awarded Fellowship - 1970 Lewis Research Center Unable to accept
	Dept. of Economics			
	Baldwin-Wallace Coll.			
	Berea, Ohio 44017			
	(216) 826-2193			
RoTte, Kurt C.	Asst. Professor	M.S.	33 Bioengineering, Power Generation, Environmental Quality	No
	Dept. of Mechanical Engg. Technology			
	Univ. of Dayton			
	Dayton, Ohio 45409			
	(513) 229-4216			
Bites, William E.	Asst. Professor	Ph.D.	33 Systems analysis of court systems using simulation	No
	Dept. of Aerospace & Mechanical Engg.			
	Univ. of Notre Dame			
	Notre Dame, Ind. 46556			
	(219) 283-2107			

FIRST CHOICE

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Kuo, Chiang-Hai	Assoc. Prof. Dept. of Chem. Engg. P. O. Drawer CN Miss. State Univ. State College, Miss. 39762 (601) 325-4732	Ph.D.	36	Process analysis and simulation	MSC-NASA, Houston, 1971
Thuesen, Gerald J.	Assoc. Prof. Sch. of Indust. & Syst. Engg. Georgia Tech Atlanta, GA 30332 ( ) 894-2314	Ph.D.	33	Economic decision-making; development of quantitative techniques for evaluating the desirability of economic alternatives for water pollution control.	Stanford Univ.-1970
Jermann, William H.	Assoc. Prof. Dept. of Elec. Engr. Memphis State Univ. Memphis, TN 38111 (901) 321-1175	Ph.D.	36	Small computer usage; analog & hybrid simulation techniques digital circuits & filters	MSCC-1969 & 1968
Eisenstein, Izzydor	Professor, Mech. Engr. Ph.D. School of Engr. Purdue Univ. Calumet Campus Hammond, Ind. 46323 (219) 844-0520	Ph.D.	57	Mechanical Engineering (Eng. Mechanics, vibrations, stress analysis, mech. devices & design, computer design)	MSC-Houston, 1969 Design
Spencer, Joseph H. Jr.	Instructor-Eng Tech. York Tech. Educ Ctr Hy. 21 By-Pass Rock Hill. S.C. (803) 328-3843	B.S.	27	Materials application to various end use requirements, strength of materials, structural analysis	?
Buehler, William L.	Assoc. Prof. Dept. Manuf. Tech. Indiana Univ.-Purdue Univ. at Indianapolis 1201 E. 38th St. Indpls., Ind. 46205 (317) 923-1321	M.S.	31	Optimum Mechanical Systems design, transportation systems analysis & design.	No
Manley, David B.	Asst. Prof. Chem. Engr. Dept. Univ. of Missouri-Rolla Rolla, Mo. 65401 ( ) 341-4431	Ph.D.	32	Distillation and Phase Equilibrium Studies	No

FIRS: CHOICE

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Ruppel, Andrew C.	Asst. Prof. McIntire Sch. of Commerce, Rouss H. Univ. of Va. Charlottesville, VA 22903 (703) 924-3175	Ph.D.	33	Data bank construction & utilization of organizational intelligence systems computer-assisted instruction.	No
Sonner, Jan R.	Instr.-Tech Dept Sch of Eng & Tech So. Ill. Univ. Carbondale, IL 62901 (618) 536-3396	M.S.	34	Propagation research & antenna design.	No
Yuster, Richard D.	Asst. Prof. Elec. Tech. Dept. Queensborough Comm. Co. 11. Springfield Blvd., Bayside, N.Y. 11364 (212) 631-6207	M.S.E.E.	29	Digital computer theory & programming (fortran, cobol)	No
Sweet, Richard F.	Assoc. Prof.-Physics Univ. of So. Ala. 307 Gaillard Dr. Mobile, AL 36688 (401) 460-6224	Ph.D.	33	Combination mass-spectrometer & volume- measure apparatus to give density of particulate matter in air samples.	No
Meyer, Theodore A.	Lecturer, Marketing Coll of Business & Management Studies Univ. of So. Ala. Mobile, AL 36608 (205) 460-6411	Ph.D.	55	Industrial marketing management	No
Talavage, Joseph J.	Asst. Prof.-Sch. of Ins. & Syst. Eng. Ga. Inst. of Tech. Atlanta, GA 30332 (404) 894-2306	Ph.D.	32	Transportation systems, counts managements systems, systems theory	No
Estes, Carl B.	Asst. Prof.-Indus. Engr. & Mgmt. Sch. of Ins. Eng. Oklah. State Univ. Stillwater, OK 74074 (405) 372-6211	Ph.D.	35	Simulation of facility designs over the real time domain.	No

## FIRST CHOICE

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Gleicher, Norman J.	Assoc. Prof. Dept. of Engr. St. Univ. of N.Y. Maritime College Fort Schuyler, Bronx, N.Y. 10465 (212) 892-3000	M.E.E.	32	Statistical communication theory including estimation & random sampling techniques.	MSFC-1967
Empaincourt, Jacques L.G.	Teaching Asst. Geography & Civ. Eng. Dept. of Geography Box 1945 Univ. of Ala. Univ. of AL 35486 (205) 348-5095	M.S.	126	Political Geography-Climatology	No
Pao, Yen-Ching	Professor of Mech. Engr. & Eng. Mech. Univ. of Nebraska Lincoln, Neb. 68508 (402) 472-2378	Ph.D.	36	Mathematical modeling & analysis of engr. system design with applications of computer, computer graphics, & computer plotter.	No
Yu, Francis R. S.	Assoc. Prof. Elec. Engg. Dept. Wayne State Univ. Detroit, Mich. 48202 ( ) 577-3904	Ph.D.	37	Optical diffraction, communication theory, life sciences	Stanford-NASA-Ames Ctr. 1971
Van Poolen, Lambert J.	Asst. Prof.-Engr. Calvin College Grand Rapids, Mich. 49506 (616)949-3000	Ph.D.	32	Heat transfer, thermodynamic property studies, overall system design	No
Lindsey, Joseph F.	Assoc. Prof. Systems Analysis 305 Gaskill Hall Miami Univ. Oxford, Ohio 45056 (513) 529-4829	Ph.D.	47	Information retrieval	No
King, Franklin G.	Asst. Prof. Chem. Engr. Lafayette College Easton, PA 18042 (215) 253-6281	D.Sc.	32	Computer applications in chem. engg. design	No

1<sup>st</sup> CHOICE

Name	Business Address & Phone	Degree Ph.D.	Age	Research and/or Design Interest	Participated Previously
Drozin, Vadim G.	Professor Dept. of Physics Bucknell Univ. Lewisburg, PA 17837 (717) 524-1213		58	Engineering design implementing the cybernetic design of a totally automated teaching-learning process	No
Tomko, George M. Jr.	Asst. Prof. Indus. Eng. Dept. W. Virginia Univ. Morgantown, W. VA 26506 (304) 293-3970	Ph.D.	38	Surface integrity in electric discharge machining of high strength steel	No
Traver, Alfred E.	Asst. Prof. Mechanical Engr. Tenn. Tech. Univ. Cookeville, TN 38501 (615) 528-3268	Ph.D.	32	Continuing improvement and research in the air pollution area, continuing applications for optimal control techniques.	No
Kramer, Herbert J.	Asst. Prof. Mechanical Eng. Dept. Villanova Univ. Villanova, Pa. (215) 527-2100	Ph.D.	33	Thermal and mechanical systems	No
Scholten, William B.	Asst. Prof. Coll. of App. Sci. & Eng. Univ. of Wisc-Milw. Milwaukee, Wis. 53201 (414) 963-4089	Ph.D.	36	Continuum thermodynamics, tensor analysis, irreversible thermody- namics.	No
Long, Walter A.	Asst. Prof. Mathematics Westchester Comm. College Valhalla, N. Y. 10595 (914) WH6-1616	M.A.	49	Mechanics, abstract algebra Individualized instruction in physics & mathematics	MSFC-1967-68
Wolff, Robert L.	Asst. Prof. Mech. Engr. Tech. Univ. of Dayton Dayton, OH 45409 (513) 229-4216	M.B.A.	35	Computer aided manufacturing Machine design-fluid power & control systems	No
Briggs, Louis Isaac	Professor Dept. Geology & Mineral. Univ. of Michigan Ann Arbor, Michigan 48104 (313) 764-2434	Ph.D.	51	Coastal sedimentation, strati- graphy, geologic systems analy- sis; General: information systems computer analysis	No

## FIRST CHOICE

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Philips, Winfred M. Jr.	Asst. Prof. Aerospace Engr. 233 Hammond Bldg. Penn State Univ. Univ. Park, PA 16802 (814) 865-2569	DSc.	31	Compressible flows, biomedical engineering	No
Alexander, Charles K.	Asst. Prof. Dept. of Elec. Eng. Clippinger Labs. Ohio University Athens, Oh. 45701 ( ) 594-6998	Ph.D.	28	Identification, modeling, & analysis of ecological, environmental, social, & economical systems	No
Davis, Donald E.	Asst. Prof.; Eng. Univ. of N.C. at Charlotte	Ph.D.	33	Engineering systems design projects with both electrical and mechanical involvement.	No
Shamblin, James E.	Professor, Sch. of Ind. Eng. & Manag. Oklahoma St. Univ. Stillwater, OK 74074 (405) 372-6211	Ph.D.	39	Operations research Scheduling, project management	No
Scherr, Pius N.M.	Instructor Rochester St Jun Coll Rochester, MN 55901 (507) 288-6101	M.S.	27	Communications & systems.	No
Grant, Lane D.	Physics Instructor Roch. St. Jun. Coll. Rochester, MN 55901 (507) 288-6101	M.A.	38	Design of computer programs for student-faculty use & research.	No
Borwick, Roger W.	Physics-Sci. Instr. Roch. St. Jun. Coll. Rochester, MN 55901 (507) 288-6101	M.S.	32	Systems approach to learning, medical techniques & life support systems of the space program & data (medical) interpretation.	No
Honea, Robert B.	Asst. Prof. Dept. of Geography East Tenn. St Univ. Box 2656 ETSU Johnson City, TN 37601 ( ) 926-1112	M.A.	30	Application of remote sensing techniques to environmental problems	No

FIRST CHOICE

<u>Name</u>	<u>Business Address &amp; Phone</u>	<u>Degree</u>	<u>Age</u>	<u>Research and/or Design Interest</u>	<u>Participated Previously</u>
<b>McAleece, Donald J.</b>	Assoc. Prof. of Mech. Engr. Tech. Purdue University Fort Wayne Campus 2101 Coliseum Blvd. Fort Wayne, Ind. 46805 ( ) 483-8121 Ext. 304	M.A.	53	High temperature materials, manufacturing processes, heat transfer, fluid flow, industrial waste treatment.	No
<b>Glreason, James G.</b>	Professor, Dept. of Mechanical Engineering Univ. of Arkansas Fayetteville, Ark. 72701 (501) 575-3153	M.S.	56	Heat engine exhaust emissions	No
<b>Evangelista, John J.</b>	Asst. Prof. Chem. Engr. Dept. Lafayette College Easton, PA 18042 (215) 253-6281	Ph.D.	28	Mathematical modelling in thermodynamics, kinetics, or heat transfer	No
<b>Stickney, George H.</b>	Assoc. Prof.: Mech. & Aero. & Civil Engr. Depts. Univ. of Missouri-Columbia. Columbia, MO 65201 (314) 449-9695	Ph.D.	52	Composite materials, vibrations, vehicular design for safety, engineering management	NASA-MSFC Houston-1971
<b>Buyco, Edgar H.</b>	Assoc. Prof. Engineering Purdue U.-Calumet 2233-171st Str. Purdue Univ. Hammond, Ind. (219) 844-0520	Ph.D.	41	System design	No
<b>Hoffman, Richard O.</b>	Assistant Prof. Dept. of Ind. & Man. Systems Nebras. Hall W190 Univ. of Nebraska Lincoln, Neb. 68508 (402) 472-2381	Ph.D.	32	Hospital man. games, hospital surgical system, premature baby intensive care systems.	No
<b>Hayes, Russell M. Jr.</b>	Asst. Prof. Elect. Engr. Dept. Ohio Univ. Athens, Oh. 45701 (614) 594-6630	Ph.D.	38	Development of interdisciplinary design oriented courses at grad. & undergraduate level	MSFC-Huntsville 1966-67

## FIRST CHOICE

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Plass, Harold J., Jr.	Prof. of Mech. Engr. School of Engr. Univ. of Miami Coral Gables, FL 33124 (305)284-2571	Ph.D.	49	Application of systems methods to ecological problems, resource problems	No
Gonzalez, Rafael C.	Asst. Prof.-Elec Engr. Ph.D. College of Engr. The Univ. of Tenn. Ferris Hall Knoxville, TN 37916 (615) 974-2579	Ph.D.	29	Data analysis & automatic machine decision making. Pattern recognition, image processing by computer, artificial intelligence, learning & adaptive systems.	No
Fromm, Frederick R.	Teaching Instr. Elect. Eng. & Comp. Science Coll. of App. Sci & Eng. Univ. of Wisc.-Milwaukee Milwaukee, Wis. 53216 ( ) 963-5173	M.S.E.E.	22	Earth resource data reduction & pattern recognition	No
Northouse, Richard A.	Asst. Prof.-Elect. Eng. Ph.D. & Computer Science The Univ. of Wisc.- Milwaukee, Wis. 53201 (414) 963-5184	Ph.D.	33	Pattern recognition, clustering, adaptive systems, computer lang., automatic control systems.	Houston-Research Program 1971
Kocourek, Charles J.	Teaching Instr. Electrical Engr. Univ. of Wisc.-Milw. Milwaukee, Wis. 53201 (414) 963-4551	B. S.	24	Pattern recognition, computer lang. systems and control systems	No
Eigen, Daryl J.	Teaching Inst. Psych. & Elec. Engr. Univ. of Wis.-Milw. Milwaukee, Wis. 53201 (414) 963-5189	B.A.	24	Pattern recognition and clustering of earth resources data	No
Deason, Dewey H.	Assistant Professor Dept. of Civil Engr. Tennessee Tech. Univ. Cookeville, TN 38501 ( ) 528-3261	Ph.D.	40	Finite element methods and experimental structural analysis	No
Warner, Harold D.	Asst. Professor Social Sci. Dept. Univ. of Mo.-Rolla Rolla, Mo. (314) 341-4811	Ph.D.	28	Highway vehicle accident investigation Human factors engineering psychology	No

Name	Business Address & Phone	Degree	Age	Research and/or Design Interest	Participated Previously
Boness, Louis F.	Asso. Prof. Computer Technology, Purdue Univ, North Central Campus Westville, Indiana 46391 (219) 785-2541	MBA	45	None-Full time teaching Assignment including preparation of New Course materials precludes significant Research	No
Berry, Richard W.	Prof. Dept. of Geology San Diego State Univ. 5402 College Ave. San Diego, Calif. 92115 286-5594	Ph.D.	39	Interactions of clay sediments with dissolved constituents of natural water systems.-Cell de- sign for separation of clay minerals by electromagnetic tech.	No
Sureshwara, B.	Ast. Prof. Dept. of Civil Eng. Valparaiso Univ. Valparaiso, Ind. 46383 462-5111 ext. 471	Ph.D.	30	Vibrations, Plasticity	No
Skinner, Chas. Wm.	Asst. Prof. Computer Science N. C. State Univ. Raleigh, N. C. (919) 755-2859	Ph.D.	36	Inductive Inference, Questions and answering; A fact retrieval system with inductive inference capabilities.	No
Clark, Wilburn O.	Associate Prof. Electrical Engineering Arizona St. University Tempe, Arizona (602) 965-3716	Ph.D	34	Completed Phd level project in Top Down Analysis of Information Syst. Supervising-APL/6400-CDC Implementa- tion; PL/I/Implementation in FORTRAN, Operator Precedence Grammar Analyzer, BNF-Driven Synthesizer, and Dynamic Database management Information Syst.	No

## APPENDIX II

1. Description of Tours
2. Miscellaneous Items
  - a. Typical Schedules
  - b. Stationery, Identification Card, Note Pad
  - c. Final Presentation Invitation
  - d. Final Presentation Program Folder

## 2. DESCRIPTION OF TOURS

The participants were given a conducted tour of Marshall Space Flight Center on the second day of the program. The tour included the SKYLAB mock-up, neutral buoyancy facility, space station mock-up, test facilities, simulation units in the computation laboratory, and other points of interest.

On July 30-31, the group toured the Kennedy Space Center. Briefings of the various ongoing programs (Apollo, Skylab, etc) as well as site visits of the VAB Launch Control, launch sites and other aspects of the NASA Launch facilities were conducted. A highlight of the tour was the viewing of the Apollo 17 vehicle and observing components and the launch tower for the Skylab vehicles in the VAB.

On July 17-17 the group toured the Manned Spacecraft Center, Houston, Texas. In addition to viewing the facilities and operations of the Center, this trip afforded the opportunity to meet jointly with the Design group at MSC. The meeting was quite enlightening to see both the differences in and similarities of the two programs. (The Houston group later toured the Marshall Center, and reciprocation was possible.)

On other occasions, members of the group visited Washington, D. C., Goddard Space Flight Center, Mississippi Test Facility, Governmental offices in Atlanta, Ga., and Lexington, Kentucky. These visits were most important and provided the opportunity to acquire much data pertinent to the program.

As in past years, it is thought the tours and site visits continue to be a vital part of the summer program. They provided a great source of information for program input as well as afforded a change of pace and opportunities for participants to become more acquainted with each other.

# AUBURN UNIVERSITY

AUBURN ALABAMA



## ENGINEERING EXTENSION SERVICE

NASA-ASEE Sponsored Summer Faculty  
Systems Engineering Design Program  
Marshall Space Flight Center  
Telephone (205) 453-1619, 453-1626

Address Reply To:  
Auburn Design Program  
Building 4202  
Marshall Space Flight Center, AL 35812

August 14, 1972  
S-34

### SCHEDULE

#### Saturday, 12 August 1972

0800- Bldg. 4202  
Work on Final Report

#### Monday, 14 August 1972

0800-0815 Bldg. 4202, Staff Office  
Project Leader/Staff Meeting

#### Tuesday, 15 August 1972

0800-0815 Bldg. 4202, Staff Office  
Project Leader/Staff Meeting

1700- Bldg. 4200, Morris Auditorium  
Practice for Final Presentation

#### Wednesday, 16 August 1972

0800-0815 Bldg. 4202, Staff Office  
Project Leader/Staff Meeting

1700- Bldg. 4200, Morris Auditorium  
Dress Rehearsal for Final Presentation

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#### a. Typical Schedule

# AUBURN UNIVERSITY

AUBURN ALABAMA



## ENGINEERING EXTENSION SERVICE

NASA-ASEE Sponsored Summer Faculty  
Systems Engineering Design Program  
Marshall Space Flight Center  
Telephone (205) 453-1619, 453-1626

Address Reply To:  
Auburn Design Program  
Building 4202  
Marshall Space Flight Center, AL 35812

Marshall Space Flight Center

Auburn University

### STAFF

Dr. Reginald I. Vachon, Director

Mr. Herman G. Hamby, NASA Co-Director

Dr. Russell E. Lueg, Associate Director

Mr. J. Fred O'Brien, Jr., Administrative Director

### FACULTY FELLOWS

Dr. Richard W. Berry

Dr. Rafael C. Gonzalez

Dr. William E. Biles

Dr. Richard O. Hoffman

Prof. Louis F. Boness

Dr. Donald H. Kraft

Dr. Louis I. Briggs

Dr. Theodore A. Meyer

Dr. Wilburn O. Clark

Dr. Andrew C. Ruppel

Prof. Jacques L. G. Empaincourt

Dr. Charles W. Skinner

Dr. Carl B. Estes

Dr. Joseph J. Talavage

Dr. Richard C. Gerhan



### SYSTEMS ENGINEERING DESIGN

Faculty Fellowship Program  
June 5-August 18, 1972

Building 4202 Phone (205) 453-1619  
Marshall Space Flight Center, Ala. 35812 453-1626  
(over)

*Note*

From the desk of -



### SYSTEMS ENGINEERING DESIGN

Faculty Fellowship Program

Marshall — Auburn

Bldg. 4202 — Phone 453-1619, 453-1626

b. Stationery, Identification Card, Note Pad

1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
AND  
AMERICAN SOCIETY FOR ENGINEERING EDUCATION  
SYSTEMS ENGINEERING DESIGN  
SUMMER FACULTY FELLOWSHIP PROGRAM

Auburn University and Marshall Space Flight Center will conclude on August 18, 1972, one of four Systems Engineering Design Programs sponsored by The National Aeronautics and Space Administration, The American Society for Engineering Education, and cooperating universities. The purpose of the programs is to provide information and experience for the participants to develop multidisciplinary systems engineering design courses or programs at their home institutions. The objectives of the programs are similar, but the missions, interests and backgrounds of each NASA Center allow variation in each program.

The multidisciplinary effort involves approaching a design problem entirely rather than the initially unconnected viewpoint of many disciplines. The unquestioned advantages of such programs at a participant's institution lie in combining the student's disciplinary approach with the demands for creative systems approach problem concomitant requirement for multidisciplinary communication, engineering, physical sciences, life sciences, and human broadening and shows the potential contributions of needs of society. The Engineering Systems Design program gives each faculty participant an opportunity to broaden from both the student and teacher viewpoints.

The Auburn-MSFC participants are involved in the design of an earth resources information system of the design problem were considered by design teams with group leaders elected

ranks have been established to accommodate and staff of the NASA-Marshall Space Flight Center's activities. Seminars on topics have been conducted during the program from NASA, industries, universities, governments, and the Executive Government. The design with seminars on the system

RSVP  
Auburn University  
Building 4202  
Marshall Space Flight Center  
(205) 453-35812  
(205) 453-1619

FACULTY FELLOWS

Dr. Richard W. Berry  
San Dier University  
Dr. V. Uni  
F

Dr. Rafael C. Gonzalez  
University of Tennessee  
Dr. Richard O. Hoffman  
University of Nebraska  
Dr. Donald H. Kraft  
University of Maryland

Dr. Theodore A. Meyer  
University of South Alabama  
Drew C. Ruppel  
of Virginia  
Skinner

YOU ARE INVITED TO ATTEND  
THE FINAL PRESENTATION OF

**ERISTAR**  
EARTH RESOURCES INFORMATION  
STORAGE, TRANSFORMATION,  
ANALYSIS & RETRIEVAL

by the

SUMMER FACULTY FELLOWS  
THURSDAY, AUGUST 17, 1972

AT 2:00 O'CLOCK

MORRIS AUDITORIUM  
BUILDING 4200

GEORGE C. MARSHALL SPACE FLIGHT CENTER

Administrative Director  
Mary

## FACULTY FELLOWS

Dr. Richard W. Berry  
San Diego State University  
Dr. Rafael C. Gonzalez  
University of Tennessee  
Dr. William E. Biles  
University of Notre Dame  
Dr. Richard O. Hoffman  
University of Nebraska  
Dr. Donald H. Kraft  
University of Maryland  
Dr. Theodore A. Meyer  
University of South Alabama  
Dr. Andrew G. Ruppel  
University of Virginia  
Dr. Charles W. Skinner  
N. C. State University  
Dr. Joseph J. Talavage  
Ga. Institute of Technology  
Dr. Louis I. Briggs  
University of Michigan  
Dr. Wilburn O. Clark  
Arizona State University  
Prof. Jacques L. G. Emplaincourt  
University of Alabama  
Dr. Carl B. Estes  
Oklahoma State University  
Dr. Richard C. Gerhan  
Baldwin-Wallace College

## NASA/ASEE

### 1972 SYSTEMS ENGINEERING DESIGN SUMMER FACULTY FELLOWSHIP PROGRAM

## ERISSTAR

### EARTH RESOURCES INFORMATION STORAGE, TRANSFORMATION, ANALYSIS & RETRIEVAL

*presented by the*

### AUBURN - MSFC ENGINEERING SYSTEMS DESIGN SUMMER FACULTY FELLOWS

Dr. Herman G. Hamby, NASA Co-Director  
S & E - EA, MSFC  
AUGUST 17, 1972

Mr. J. Fred O'Brien, Jr., Administrative Director  
Auburn University

## ASSOCIATE DIRECTORS

Dr. Russell E. Lueg, Associate Director  
University of Alabama

Dr. Jim E. Cox, Consultant  
University of Houston

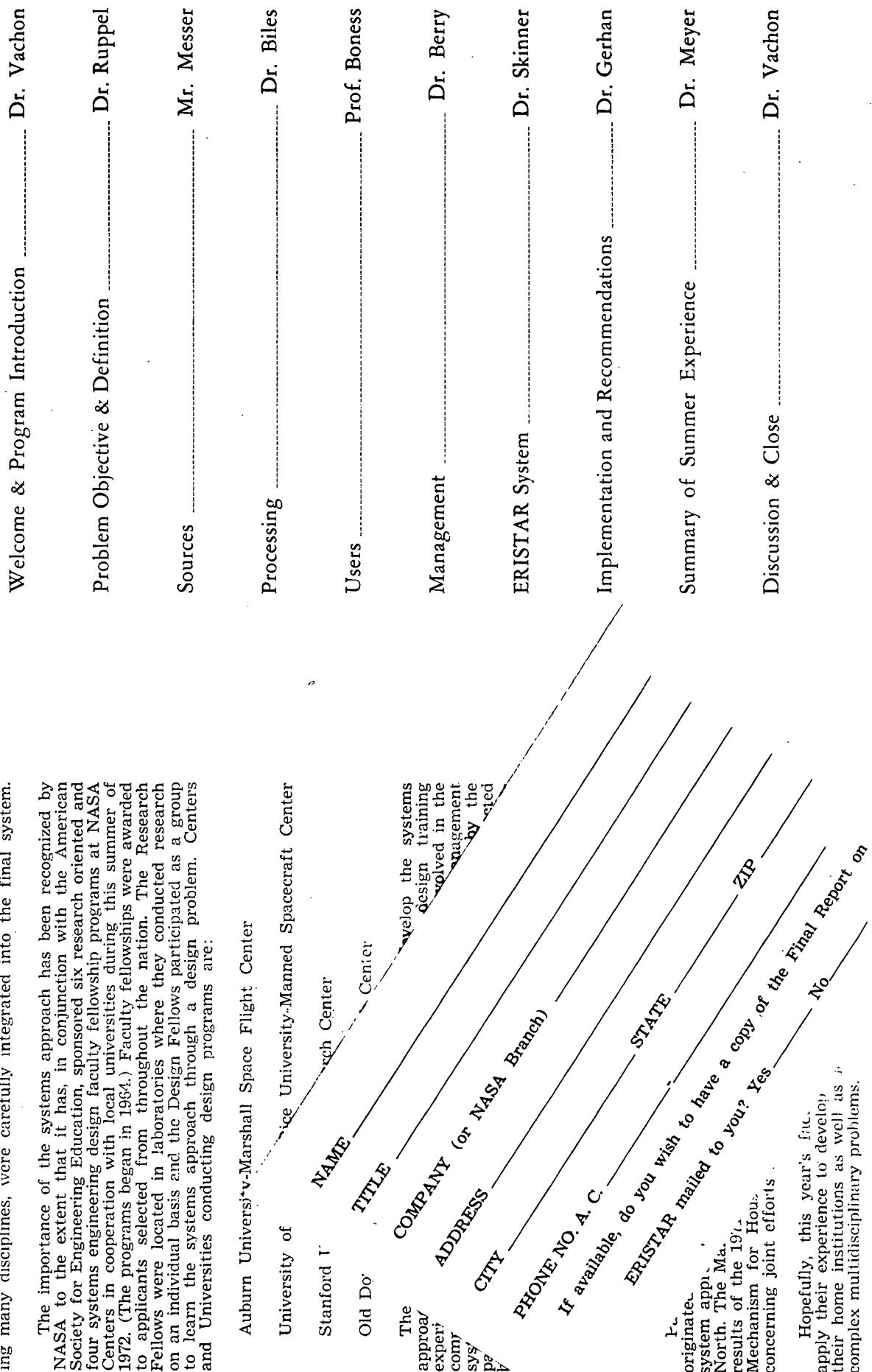
### MORRIS AUDITORIUM BUILDING 4200

### GEORGE C. MARSHALL SPACE FLIGHT CENTER Huntsville, Alabama

## PROGRAM

Systems engineering, or the systems approach, has become an accepted term to describe the multidisciplinary or interdisciplinary character of the "systematic design" of any large system. The term seems to have originated in the aerospace field where the complexity of modern aerospace systems has demanded a systematically controlled design approach to insure that all factors of all subsystems, representing many disciplines, were carefully integrated into the final system.

The importance of the systems approach has been recognized by NASA to the extent that it has, in conjunction with the American Society for Engineering Education, sponsored six research oriented and four systems engineering design faculty fellowship programs at NASA Centers in cooperation with local universities during this summer of 1972. (The programs began in 1964.) Faculty fellowships were awarded to applicants selected from throughout the nation. The Research Fellows were located in laboratories where they conducted research on an individual basis and the Design Fellows participated as a group to learn the systems approach through a design problem. Centers and Universities conducting design programs are:





# ALABAMA DEVELOPMENT NEWS

June 1972

Montgomery, Alabama

Volume III, No. 5

## Practical Use Of ERTS Data Essential For Project Success

HUNTSVILLE - Ed Hudspeth, chief of the special studies division of the Alabama Development Office, told a summer faculty fellowship meeting here recently at the Marshall Space Flight Center that it must concentrate on the practical application of information gleaned from the Earth Resources Technology Satellite (ERTS), which will be placed in orbit sometime during June.

"Regardless of how successful the Satellite is and regardless of how sophisticated a system we design, the project will be a total waste unless the information generated is in a form that the people of Alabama can use," Hudspeth stated.

The group, composed of experts in several different disciplines from various colleges and universities around the country, is sponsored by NASA and the American Society for Engineering

Education. It is presently working on the complete systems design of an earth resources information system.

The ADO's role, according to Hudspeth, is to work through the regional planners with local planners to establish an awareness of the program and to determine how information gathered by ERTS can best be used. Remotely sensed data from ERTS may be useful in managing Alabama's natural resources.

"We must inform the public of these projects, because the potential users of such information are not aware they can use ERTS data to advantage," says Hudspeth.

The applications could possibly include detection of crop diseases, insect infestations, locations of areas of pollution, areas of fish concentration, land use resource conservation and many others.

# Marshall Star

June 7, 1972

## 40 EDUCATORS FROM 31 COLLEGES IN FACULTY FELLOWSHIP PROGRAM

Forty educators from 31 colleges and universities began design and research programs at the Marshall Center Monday.

The two programs are parts of the Summer Faculty Fellowship program, one of 10 conducted at NASA centers throughout the nation in conjunction with the American Society for Engineering Education.

The design program here will run from June 5 to August 18. The research program will run until August 11.

The research portion of the Fellowship program has been running eight years. This is the fifth

year in which the Marshall Center has served as host for the design program.

Through these programs, university and college faculty members work with their counterparts in NASA on research of mutual interest. Interests range in subject matter from nuclear propulsion and rocket engines to studies involving ecological problems and medical equipment.

J. Fred O'Brien of Auburn University is director of the research program. Marion I. Kent is the MSFC representative. Twenty-five educators from 20 institutions are participating.

Dr. R. I. Vachon of Auburn and Herman G. Hamby of the Marshall Center are co-directors of the design program in which 15 educators from as many institutions are participating.

Some universities have more than one educator attending, some in each program.

Universities and colleges represented and the faculty members from each are:

Oklahoma State — Dr. Carl B. Estes; San Diego State — Dr. Richard W. Berry; Notre Dame — Dr. William E. Biles; Purdue — Prof. Louis F. Boness and Dr. Keith H. Hawks; University of Michigan — Dr. Louis I. Briggs; Arizona State — Dr. Wilburn O. Clark;

University of Alabama — Prof. Jacques L. Emplaincourt, Dr. Donald J. DeSmet; Dr. James E. Dudgeon and Dr. Ammon Sitchin; Baldwin-Wallace College — Dr. Richard C. Gerhn; University of Tennessee — Dr. Rafael C. Gonzalez; University of Nebraska — Dr. Richard O. Hoffman; University of Maryland — Dr. Don H. Kraft; Georgia Tech — Dr. Joseph J. Talavage and Dr. Fred E. Williams; North Carolina State — Dr. Charles W. Skinner; University of Virginia — Dr. Andrew C. Ruppel;

University of South Alabama — Dr. Theodore A. Meyer and Dr. J. Mark Elliott; Bucknell — Dr. Paul DeHoff; Mississippi State — Dr. Jimmy L. Dodd, Dr. Murl W. Parker and Dr. Jerry W. Rogers; Iowa State — Dr. Jerome C. Glaser; Tennessee Tech — Dr. Edwin I. Griggs; California State Polytechnic — Dr. William L. Hendricks and Dr. Robert S. Rudland; East Tennessee State — Prof. Robert B. Honea; University of Toledo — Dr. Duen-Ren Jeng; University of Illinois — Dr. Gerald R. Karr;

Western Michigan — Dr. John H. Kusmiss; Central Missouri State College — Dr. Frank E. Martin; Louisiana Tech — Dr. Jerry D. Moore; Talladega College — Dr. Richard A. Morrison; University of Georgia — Dr. Judy M. Olson; South Dakota State — Dr. Gary A. Sawyer; Florida State — Dr. John W. Sheldon; and Auburn — Dr. Paul D. Smith.



**FELLOWSHIP LEADERS** — Leaders in the Summer Faculty Fellowship program took a few minutes out for a break last week just before a meeting began in Building 4200. The Research and Design teams here for the summer include 40 educators from 31 colleges and universities from throughout the United States. Seen here are (l to r) Herman Hamby, PD-MP, and Dr. R. I. Vachon, Auburn University, co-directors of the Design program, and Marion I. Kent, MSFC representative, and J. Fred O'Brien, Auburn, director of the Research program. Participants in the program will work with MSFC counterparts on projects of mutual interest to NASA and the American Society for Engineering Education.

# The Huntsville Times

Friday, August 4, 1972

## Satellite Begins Mapping Alabama Today *Takes Two Minutes to Cross State*

A one-ton satellite with electronic eyes is to zip across Alabama in two-minute dashes today through Sunday, photographing the terrain from 570 miles up in what is promoted as a significant step in managing natural resources in the state.

The vehicle, the first Earth Resources Telechology Satellite (ERTS), is to relay data on land use planning, geological and hydrological resources and pollution.

Photographs taken by the satellite will be "dumped" to Goddard Space Flight Center, Greenbelt, Md., and then provided to investigators of

the University of Alabama, the Alabama Geological Survey and Marshall Space Flight Center.

The satellite goes around the earth about every 103 minutes, takes less than two minutes to cross Alabama from the northwest to the southeast and gathers data

over a band about 100 miles wide on each pass.

ERTS will no longer be orbiting over Alabama after Sunday but will return for additional passes every 18 days as the earth rotates below.

Dr. George McDonough, director of Marshall Center's

Environmental Applications Office, said the objective is to create a statewide land use map that would enhance development planning.

A long-range effort is to produce an Earth Resources Management Information System for Alabama, leading to more efficient use of the state's resources, McDonough said.

Experts contend that the butterfly-shaped observatory can provide information for agriculture, forestry, geology, land use management, hydrology, pollution control, oceanography, meteorology and ecology.

Alabama Gov. George Wallace has committed the full support and cooperation of the state, including a substantial amount of resources, McDonough said.

Aircraft from the National Aeronautics and Space Administration, including one from Marshall Center, will provide specialized and local data in greater detail to make the broad satellite pictures more meaningful.

Marshall Center is also designing and building data collection platforms — actually buoys — that will be located in Mobile Bay and at selected river sites to cross reference data on water temperatures, salinity and pollution with information picked up by the satellite.

A \$250,000 grant was made to the University of Alabama by the space agency to cooperate with other agencies in using ERTS data.

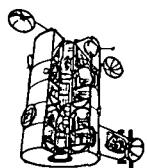
Involved in the project other than the University of Alabama and Marshall Center are the Alabama Geological Survey, Alabama Marine Science Consortium at the Marine Sciences Institute, Dauphin Island, Ala.

Auburn University's Dr. Reginald Vachon is coordinating plans to develop the information system.

The Alabama Development Office is one of the major coordinators of state users and conducted meetings in April to correlate use of the satellite data.

At least 15 summer faculty fellows working at Marshall Center are helping in the design of the information system.

# Marshall Star



ght Center — Huntsville, Ala. 35812

August 16, 1972

## New Earth Resources Info System Will Enhance State

Plans for a regional Earth Resources Information System will be revealed here tomorrow by a team of college and university faculty members.

Using Alabama as a prototype, the Summer Faculty Fellows have been developing the new system during their 11-week stay at the Marshall Center.

Dr. Reginald I. Vachon of Auburn University directed the program along with Herman G. Hamby, a physicist in the Environmental Applications Office. This office, under the direction of Dr. George F. McDonough, has been studying the use of satellite data to solve problems in resources management, pollution abatement, and other environment-related areas.

In MSFC's Morris Auditorium at 2 p.m. tomorrow, the information system called ERISTAR, Earth Resources Information Storage Transformation, Analysis and Retrieval, will be explained to Marshall Center employees. ERISTAR is a proposal to gather a variety of data from sources such as satellites, buoys or other instrumented packages and cause it to be correlated into a cross section of data that could enhance industrial development, conserve natural resources and combat pollution.

**Marshall Center employees are invited to attend the presentation in Morris Auditorium. It starts at 2 p.m. and ends at 4 p.m., according to Dr. Vachon.**

Dr. Vachon said the information will be made available to an Alabama Earth Resources Information Committee established by Gov. George C. Wallace. Drs. Vachon and McDonough serve on this committee.

Dr. McDonough said the impending flood of new information from the Earth Resources Technology Satellite (ERTS) can provide great benefits to the people of Alabama. To realize its potential, however, there is need for a well designed information management system to assure proper data dissemina-

(See RESOURCES on Page 4)

### RESOURCES

(Continued From Page 1)

tion to the users within the state, he added. This system will require the identification and orientation of users, the development of necessary technology to cope with large quantities of data, and the establishment of working interfaces with other government agencies, particularly the regional government groups within Alabama.

Since the project started here, the Earth Resources team has met with officials in Georgia, Tennessee and South Carolina to explain plans for the system and to obtain a broad base of ideas on the requirements for such a system.

It is anticipated that this system ultimately could be adapted to use by any state wishing to utilize data provided by Earth resources satellites, supplemented by information gathered on Earth.

The Summer Faculty Fellows are involved in a joint National Aeronautics and Space Administration and American Society for Engineering Education program aimed at the development of multidisciplinary systems engineering design courses.

Participants include Dr. Richard W. Berry, San Diego State University; Dr. William E. Biles, University of Notre Dame; Prof. Louis F. Boness, Purdue University; Dr. Louis I. Briggs, University of Michigan; Dr. Wilburn O. Clark, Arizona State University; Prof. Jacques L. G. Emplaincourt, University of Alabama; Dr. Carl B. Estes, Oklahoma State University; Dr. Richard C. Gerhan, Baldwin-Wallace College; Dr. Rafael Gonzalez, University of Tennessee; Dr.

Richard O. Hoffman, University of Nebraska; Dr. Donald H. Kraft, University of Maryland; Dr. Theodore A. Meyer, University of South Alabama; Dr. Andrew C. Ruppel, University of Virginia; Dr. Charles W. Skinner, North Carolina State University and Dr. Joseph J. Talavage, Georgia Institute of Technology.

Associate directors are Dr. Russell E. Lueg, University of Alabama and J. Fred O'Brien, Jr., Auburn University.

**MARSHALL STAR**

**APPENDIX IV**

**PARTICIPANT EVALUATION FORM SUMMARY**

## Participant Evaluation Form Summary

7. Have set 2 wks in fall quarter '72 to demonstrate program in one of my courses. Encourage profs in 4 other depts to try in a course in winter quarter '73. Then select problem common to all, depts act as task groups. Limit participants to good seniors.

1) Pick problem, e.g., land use; 2) contact likely participants (Engr., Environ. Science, City Planning); 3) coordinate with Univ. Office of Research

propose multidisciplinary approaches to systems analysis with societal problems. Matrix management approach used to organize personnel for project. Typical systems approach used to guide project along.

not design as such. Plan to con't work of ERISTAR in State of Tenn.

Already there

Use systems approach to solve socio-economic problems. Open to students in all disciplines

Would like to have seniors from the following work on design project; Industrial engr., business admin., law, mech. engr., economics, marketing

Along lines of earth resource information & information management by gathering local interest of staff & cognate disciplines, developing course description, getting some Federal (NSF?) funding

8. Yes-- 15                    No-- 0

Tell people they must have utilities turned on themselves & maybe in person; what places past participants liked (restaurants, entertainment, apartments, etc.); best time to hunt for apartments. Mail earlier.

Notification that bank was in Bldg. 4200; more complete list of housing units Mail earlier; more housing info

More housing info

1) publish mail forwarding address at Marshall for those traveling long dist.;  
2) send addresses of offices of Apt. houses used by previous years participants.  
Xerox copy of yellow page not very helpful

More info on housing (without making arrangements for participants): which units require full 3 mo. lease; extra money for short lease; which will not sign short leases, exp. for 3 br.; etc.

Develop "approved list" of apartments where terms are negotiated in advance

9. Change from usual routine; group dynamics experience; exposure to program interaction with participants; introduction to systems design; multidisciplinary interaction

Enhancement of one's skill in systematic problem solving; opportunity to work on problem of importance; opportunity meet & work with pros from other disciplines; opportunity to view workings of major Federal agency

Education--learning weakness & strengths of systems approach; learning about NASA in variety of locations; personal contacts made

Permits one to consider approaches & viewpoints from other disciplines, & from persons in own discipline who have different training & experience; opportunity to get publication or two

9. con'd.

Good training in systems approach; excellent study in group dynamics; dealt with very timely problem  
Training exercise; broadened exposure  
Good exposure to systems approach; working on practical problem; exposure to area of Earth Resources  
Interaction with other persons  
Interface with variety of people; involvement in contemporary problem; exposure to "glamorous" agency like NASA; contact with guest speakers  
Multidisciplinary interaction; short-term concentrated activity; exposure to new areas of interest  
Educational experience extraordinaire; chance to meet good people in several areas of technical expertise; chance to learn about exciting new problem; chance work on problem area; good management of group  
Interfacing with other participants, staff & people at Marshall--working together with those people with different backgrounds--creativity  
Intense study of problem with interaction & contribution of diverse faculty staff in multidiscipline environment

10. Frustrating at times to be caught in conflict between learning experience & design program; at times speakers & discussions hinderance to design pro

Insufficient reimbursement for relocation expenses

May have "wasted" effort on problem which was too big

11 week program means no vacation

Relocation, barely adequate salary

1) Three months away from home institution create difficulties in some cases (get behind in correspondence & modifications to papers in review, etc.);

2) relocation presents some logistical problems for family

Difficulty of maintaining balance between training objective & problem-solving aim; not enough involvement in program by host NASA facility

Lack of time to study strategies associated with directing systems approach; Utilize summer program experience to follow through implementation of recommendations

Participant loses money compared to staying at home, if possible; absorbs entire summer--not any vacation time

Difficulty in syncronizing program start & stop times with many different Univ.

Group systems approach without specific expert management decision is inefficient  
Maybe need little more background before project starts or at beginning of it

11. Yes--15 No-- 0

Jim Shamblin--OSU-IE

Palmer Terrill--OSU-IE

Tony Smith--Auburn-IE

Dr. C. C. Moore, Director Research Center

Frederick R. Davidson

Dr. Thomas P. Cullinane, Univ. Ala., Huntsville (IE)

Dr. James R. Smith, Tenn. Tech (IE)

Dr. Wayne C. Turner, Va. Tech (IE)

Dr. Wayne Claycombe, U. Tenn. (IE)

Dr. Marshal Pace

Dr. Asa Bishop

Dr. J. Wayne Walls

11. con'd.

L. G. Callahan (Ga. Tech)  
T. Kvalseth (Ga. Tech)  
Prof. Robert Ebert--Baldwin-Wallace College  
Dr. James Thomas, U. Nebraska  
Dr. Christina Gregg, Medical School, Jackson, MS  
Keith Crane, 542 Circle Drive, Ann Arbor, MI  
G. V. Kvitek (Elec. Engr.)  
Dr. James D. Powell, NC State  
Dr. David A. Link, NC State  
Dr. Laurence Heilprin, U. Maryland  
Dr. T. W. Hill, Jr., Purdue  
Dr. Stuart Mann, Penn State (send him final report if possible)  
Richard McCammon--U. Illinois  
Peter Buttner--R.P.I., Troy, N.Y.  
Dr. Neal Lineback--U. Ala.  
Dr. R. Fusell--U. Ala.

12. Yes-- 15                    No-- 0

Systems Analysis & Approach helpful in teaching students how to describe & improve library operations & make better library management decisions  
Teach courses in design of information storage & retrieval systems & in design of simulation models  
Way to document approach to solving problem  
Will be released 1/3 time next year to explore problem  
Use systems approach to solve socio-economic problems  
Teaching systems courses  
Present systems approach as general philosophy & illustrate by project similar to but of much less magnitude  
Industrial Production Systems Analysis Courses I & II each have weekly lab.  
Typical requirement is to have students solve realistic systems problem.  
Considering trying this methodology in 2 graduate seminars in geochemistry of sediments  
Using it as framework for analysis in project-type courses; incorporating in discussions of problem-solving techniques & philosophies  
Similar to this summer's program  
Design courses at Sr. level; lay out procedure, illustrate with simple examples, monitor

13. De-emphasize training aspects in favor of tackling critical problems; try package "gee-whiz" trips earlier in program; perhaps 1st wk devoted to orientation to NASA & systems approach; schedule speakers for 2 hrs (1000-1200 & 1300-1500); request participants to provide list of desired speakers before arrive for start of program; would smaller be more effective? (15-20 seems to be used because of training desires)  
Scrap that damn C54; more \$; less speakers late in program; means to limit one speaker, i.e., 3½ hours too much  
Require more homework before program begins; review systems approach in more detail, frequently & earlier in program  
Screen speakers & appraise them of time limits & subject area; schedules days so speakers will always speak in afternoon & mornings will be free for individual or group work

13. con'd.

Limit time spent in trips & hearing speakers to allow more time for analysis of problem; spend more time in task group & committee activities rather than project meeting

More initial guidance

Impose more requirements for internal communications; limit group meets to communication only, not for decision-making

Place on 2 summer basis

Schedule speakers 8-10, 10-12, 1-3, 3-5; require speaker stop after 1 hr & let those interested stay next hr

Pragmatic aspects of situation stated prior to day before having report done

More definite design objective; tighter direction & control by staff

More minority group & women participants, few nontechnical participants if project warrants; tell people of references to look up background before coming

In general methodology I would not suggest change. Success depends largely on 2 factors--expertise of interacting staff & competence & expertise of faculty fellows

By including more background info before setting up organization & not changing organization structure once it's finalized

14. Follow-on project sounds exciting

Very memorable experience

Too many total group sessions discussion trivial items; schedule speakers to avoid conflicts with productive report writing if possible; order of speakers could have better sequence--try avoid "repetitive" sessions

This summer well spent both professionally & personally

Would like to see work on ERISTAR con'd by this group

NASA could make effective application of program by awarding small grants (\$5K-25K) for con'd research into specific areas based by design effort

Physical support services excellent; pay checks on time & spread out well; staff did good job against almost overwhelming odds to arrange travel

Generally, speaker presentation which gave overview (in about 1 hr) & then interacted with interested members were better received

Would be shame to see ERISTAR concept lie fallow in future. Some action should be taken

12. con'd.

On graduate seminar level, addressed to developing 1 major concept of a subject area

I can see methodology applied in areas of geography (i.e., political geogr.)